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## **Developing Electric Vehicle Battery Supply Chains for Inclusive and Sustainable Growth: Opportunities and Challenges in Zambia and the Democratic Republic of the Congo from SAFE and the U.S. State Department's Battery Council Workshops**

### **Introduction**

The escalating demand for clean energy technologies, notably electric vehicles (EVs), has led to significant increases in the demand for critical minerals essential for their production. This trend of demand growth is projected to continue beyond this decade.<sup>1</sup> Minerals-rich countries hope to harness the clean transition momentum and leverage their resource wealth to achieve inclusive and sustainable economic growth, giving rise to important questions like: What does minerals-focused development look like? What is the best pathway for countries to achieve their full value chain ambitions? Which integral interim steps are necessary to build the foundations of a robust ecosystem for these transition minerals? Where can countries and partner governments speed up efforts? What role does the private sector play?

The ambition to transform demand for energy transition minerals into an engine of growth is evident in both Zambia and the Democratic Republic of the Congo (DRC). The DRC produces more than 70 percent of the world's cobalt supply and is the third-largest copper producer in the world.<sup>2</sup> Zambia is another major producer of copper on the African continent.<sup>3</sup> The two countries are also rich in other battery materials and by-product minerals with important digital and defense applications.<sup>4</sup>

These two African countries hope to move farther down the value chain from mineral extraction into activities such as advanced minerals processing, battery cell manufacturing, and battery pack production to avoid the resource curse and realize the economic development potential of their

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<sup>1</sup> International Energy Agency, *Critical Minerals Market Review 2023*, 2023.

<sup>2</sup> SAFE analysis based on data from U.S. Geological Survey, *Mineral Commodity Summaries 2024*, January 31, 2024, at pages 63 and 65.

<sup>3</sup> *Ibid.*, at page 63.

<sup>4</sup> See e.g., "Taonga Clifford Mitimigi, "First Quantum Starts Output at Africa's Biggest Nickel Mine," Bloomberg, July 26, 2023; SAFE findings from expert interviews and Michael Kaumba, "Lithium Ore to be Included in the Mineral Analysis Database-Kabuswe," ZNBC, January 7, 2023; Webby Banda, *Strategy for Growing the Zambian Manganese Mining Sector Through the Lens of Artisanal and Small-Scale Mining*, October 2022, at page ii; and Jonas Gerding, "DR Congo Wants to Move Up the Battery Supply Chain," Deutsche Welle, September 29, 2023.

mineral wealth. Achieving this vision will require a formidable effort and a significant amount of resources and expertise:

- Infrastructure deficits, perceived and real reputational risks, political volatility, and other regulatory issues will need to be addressed to bring additional investors to the region.
- In addition to developing the countries' untapped resources, new refining and processing capacity will be needed to convert raw minerals into the specialized materials or metals used in battery manufacturing.
- A longer-term effort will need to be dedicated to developing the skills, competencies, and knowledge base required to undertake advanced manufacturing activities like battery cell production, which includes intricate processes that are challenging to master in even the most advanced economies.
- Finally, considering the current trends toward regionalizing supply chains, substantial regional demand for battery cells and battery packs will be needed to justify investment in local manufacturing.<sup>5</sup>

A carefully planned, step-by-step roadmap is needed to develop a manageable pathway for going downstream. Such a graduated process should start by leveraging each country's existing competitive advantages. In the case of Zambia and the DRC, this would mean the development of critical mineral resources beyond copper and cobalt starting with exploration, mining, and processing of raw materials—in the case of battery minerals, for example, first into intermediate products, then into the specialty material used in batteries. The decision to move down to the next step should be based on a careful assessment of market dynamics, other material input and power availability, local knowledge and skills, and peripheral industry.<sup>6</sup>

Ultimately, however, no one country can build a battery supply chain alone. Regional and international collaboration is essential to bring in (1) the expertise to support each country's industrial planning, (2) the capital needed to build the necessary infrastructure and industrial facilities, (3) the know-how and funding to train workers and engineers, and (4) technology and material inputs that cannot be produced locally.

To this end, Zambia and the DRC signed a cooperative agreement to establish a regional value chain in the electric battery and clean energy sector in April 2022.<sup>7</sup> During the African Leaders

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<sup>5</sup> Note: To reach economies of scale, gigafactories need a production capacity of around 6 gigawatt hours (GWh), which mean you need to be able to consume at least 6 GWh regionally. Source: Takeaways from the Battery Council Workshops in Zambia and the DRC.

<sup>6</sup> Note: The peripheral industry will be very important. Product specifications are very tight, and it tightens further down the beneficiation chain. Cathode active materials (CAM) and their precursors incur significant requirements to qualify material as acceptable feedstock for batteries. Producers of these materials will need accredited metallurgical or analytical laboratories for process control and product certification. Source: U.S.-Zambia and U.S.-DRC Battery Council Workshops.

<sup>7</sup> United National Economic Commission for Africa (UNECA), "Zambia and the DRC Sign Cooperation Agreement to Manufacture Electric Batteries," April 29, 2022.

Summit in December 2022, the two countries signed a tripartite Memorandum of Understanding (MOU) with the United States to facilitate the development of their regional and domestic electric battery value chains.<sup>8</sup>

Since then, the U.S. government announced significant infrastructure investments in the region. In May 2023, the Biden Administration announced that the Partnership on Global Infrastructure Investment (PGI) was supporting the development of the Lobito Atlantic Railway Corridor running from the DRC's border to the Lobito Port in Angola—a first step into connecting the two countries to Western markets.<sup>9</sup> More specifically, the U.S. International Development Finance Corporation (DFC) is conducting due diligence for a financing package of \$250 million for the project.<sup>10</sup> In September 2023, the European Union, through the Global Gateway program, joined the Lobito Corridor project to co-finance a feasibility study for a greenfield rail line linking Zambia to the Lobito Port.<sup>11</sup>

### **Battery Council Workshops**

While the Lobito Corridor project has been a welcome development, there are questions about what products the railway will transport. The Zambia and DRC Battery Council Workshops that took place in September 2023 aimed to answer those questions.

Following the tripartite MOU with Zambia and the DRC, the U.S. Department of State (State Department) partnered with SAFE's Center for Critical Minerals Strategy (Minerals Center) to lead a delegation of experts to determine actionable next steps to support the implementation of the MOU and address challenges to supply chain development head on. Representatives from U.S. industry, academia, federal agencies, and national labs along with international partners from Japan and the European Union gathered with the Zambian and Congolese government officials and Battery Council members.

SAFE's two-pronged goal in co-organizing the workshops was (1) to provide a platform to hear Zambian and Congolese perspectives and priorities, and (2) to share U.S. expertise and best practices in establishing sustainable, viable value chains for natural resource mining, refining, manufacturing, and exports.

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<sup>8</sup> U.S. Department of State, "The United States Releases Signed Memorandum of Understanding with the Democratic Republic of Congo and Zambia to Strengthen Electric Vehicle Battery Value Chain," Press Release, January 18, 2023.

<sup>9</sup> The White House, "FACT SHEET: Partnership for Global Infrastructure and Investment at the G7 Summit," Press Release, May 20, 2023.

<sup>10</sup> U.S. International Development Finance Corporation, "DFC CEO Nathan Meets with President of Angola Joao Lourenco to Discuss Opportunities to Drive Infrastructure Investments and Boost Economic Activity," Press Release, December 1, 2023.

<sup>11</sup> The White House, "Joint Statement from the United States and the European Union on Support for Angola, Zambia, and the Democratic Republic of the Congo's Commitment to Further Develop the Lobito Corridor and the U.S.-EU Launch of a Greenfield Raile Line Feasibility Study," Press Release, September 9, 2023.

The workshops focused on three key areas:

1. **Creating an attractive environment for investment.** Currently, Chinese investors dominate both countries' mining sectors. Slow licensing mechanisms, unpredictable operating environments, and infrastructure deficits have deterred Western investment in Zambia. In the DRC, the main barriers to Western investment are perceived and real reputational risks, as well as fiduciary, programmatic, and political uncertainty.
2. **Overcoming infrastructure challenges.** Lack of access to energy and reliable infrastructure has hampered Zambia's and the DRC's ability to move down the value chain. Minerals processing and subsequent manufacturing steps are energy intensive. Roads and railways are needed to connect different subnational jurisdictions and link Zambia, a land-locked nation, and the DRC, a predominantly land-locked nation, to global markets.
3. **Equipping local decision-makers with what it takes to build battery cells and creating a holistic battery ecosystem.** While Zambia and the DRC have ambitions to reach battery production, given the level of time, capital, and infrastructure required to successfully construct a battery manufacturing plant and recognizing that the region does not yet produce the specialty material inputs used in battery manufacturing, a more effective approach for the two countries includes tackling the issues from the two sides of the supply chain. First, they should target minerals exploration, mining, and processing (beginning) and then explore opportunities for less complex electric vehicle or other electronic manufacturing (end). Subsequently, they should work toward the middle of the value chain to get to cathode active material and anode active material production, and cell manufacturing as a later step.

This issue brief provides an analysis of the unique challenges and opportunities in each country, identified by the Minerals Center during its preparation for the workshops and on-the-ground conversations. It is followed by high-level recommendations for U.S. government and country-specific action items for all stakeholders involved. Additional considerations have been incorporated to reflect developments in the region and policies deployed by the United States and its allies since the convening took place.

The Minerals Center intends for this brief to serve as a resource for future engagement with Zambia, the DRC, and their respective battery councils. This issue brief may also serve as a source of transferable knowledge for future engagement with other minerals-rich countries with similar economic development goals.

## Opportunities and Challenges in Zambia

Zambia is the ninth-largest copper producer in the world and the second-largest copper producer in Africa, after the DRC.<sup>12</sup> Copper mining plays a significant role in the Zambian economy, with copper comprising over 70 percent of Zambian exports and 15 percent of its GDP.<sup>13</sup> Half of Zambia's total GDP comes from the capital, Lusaka, and the Zambian part of the Copperbelt, a minerals-rich region in northern Zambia and southern DRC.<sup>14</sup>

The short-term gains in the mining sector have not translated into long-term, inclusive growth due to the high price volatility of copper, high capital intensity and low labor intensity of the mining sector, and costly attempts to nationalize the sector. Between 2011 and 2021, the mining sector contributed an average of 0.2 percent to real GDP growth and represented only 2 percent of employment.<sup>15</sup> Nevertheless, copper and other mineral resources are seen as a source of economic development potential, as evidenced by President Hichilema's ambitious goal of increasing copper production from approximately 800,000 metric tons per year to three million metric tons per year by 2032.<sup>16</sup>

The key players in the country's mining sector are Zambia's state-owned mining company ZCCM Investment Holdings (ZCCM-IH), First Quantum Minerals (Canada), Vendata Resources (UK), China Nonferrous Mining (China), ERG Africa (Luxembourg/Kazakhstan), and Jubilee Metals Group (UK).<sup>17</sup> New players may soon enter the country as the Zambian government is seeking out a foreign investor for the ZCCM-IH-help Mopani Mine, with the shortlisted companies reportedly being Zijin Mining Group (China), Norinco Group (China), Sibanye Stillwater (South Africa), and an unnamed investment vehicle owned by former Glencore employees.<sup>18</sup>

Alongside these large-scale mining operations, artisanal and small-scale mining (ASM) continues—with many artisanal miners transitioning from mining gemstones and gold to mining manganese and lithium as the demand for EVs grows.<sup>19</sup> Relative to all other African countries, the Zambian ASM sector is considered the most formalized, with the government granting licenses to artisanal miners. The World Bank's Mining and Governance review rates the extent to which ASM operators

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<sup>12</sup> SAFE analysis based on data from U.S. Geological Survey, *Mineral Commodity Summaries 2024*, January 31, 2024, at page 65.

<sup>13</sup> African Development Bank Group, *Study of the Economic Diversification and Productivity Improvement in Zambia*, October 2022; and International Monetary Fund, "Boosting Sustainable Growth," in *Zambia: Selected Issues*, July 13, 2023.

<sup>14</sup> International Monetary Fund, "Boosting Sustainable Growth," in *Zambia: Selected Issues*, July 13, 2023

<sup>15</sup> Ibid.

<sup>16</sup> Lusaka Times, "Zambia's Target to Increase Copper Production to 3 Million Tonnes in the Next Ten Years is Attainable," November 1, 2022.

<sup>17</sup> Note: Countries in parentheses show where the companies are headquartered. Source: "Copper Production in Zambia and Major Projects," updated July 7, 2023.

<sup>18</sup> Chris Mfula, "Zambia Plans to Choose Buyer of Mopani Copper Mines by Month-End," Reuters, July 14, 2023.

<sup>19</sup> Twiwe Siwale, "The Current State of Artisanal and Small-Scale Mining in Zambia," IGC, November 6, 2019.

are allowed to legally operate in Zambia as “Very High.”<sup>20</sup> Although many artisanal miners have licenses and are thus considered operating legally, they still have limited access to finance, technology, and support from the government and face high area fees, royalties, and taxes. The cost of compliance with mining regulations creates additional burdens for artisanal miners.<sup>21</sup>

In terms of mineral refining in Zambia, existing facilities produce copper cathode (a type of metal sheet, not to be confused with the cathode of a lithium-ion battery), blister copper, and copper concentrate.<sup>22</sup> Two of Zambia’s copper refineries also produce cobalt products. The Chambishi Metals Refinery owned by ERG Africa has a capacity to produce 6,800 metric tons of cobalt metal per year, and the Sable Refinery owned by Jubilee Metals Group, is ramping up to produce 1,200 metric tons of contained cobalt metal per year.<sup>23</sup> The final cobalt product of the Sable Refinery is cobalt carbonate.<sup>24</sup> The Chambishi Metals Refinery was put on care and maintenance in 2020 due to a lack of feedstock, but a third cobalt refinery is under development by Kobaloni Energy, this time to build Africa’s first cobalt sulfate refinery.<sup>25</sup>

While the above numbers show how much cobalt can be refined in the country, it is challenging to track and assess the amount of cobalt mined in Zambia. Most of its cobalt production is reported as copper alloy, and pure cobalt production numbers are more likely to show imported cobalt from the DRC.<sup>26</sup>

### *Opportunities*

**Zambia offers a diversity of minerals in addition to copper.** Although the Zambian mining sector is predominantly focused on copper, companies still explore for, and produce in smaller quantities, other critical minerals including nickel, cobalt, lithium, and manganese. Recent non-copper mining projects include two nickel mines: the Enterprise Nickel Project, the largest nickel mine in Africa owned by First Quantum Minerals, and the Munali Nickel Mine, owned by Consolidated Nickel Mines Plc and CE mining.<sup>27</sup> ZCCM-IH has also opened a manganese mine.<sup>28</sup>

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<sup>20</sup> Ibid.

<sup>21</sup> Ibid.

<sup>22</sup> SAFE analysis based on information from James Barry, 2019 Minerals Yearbook, Zambia [Advance Release], U.S. Geological Survey, May 2023, at pages 46.3 to 46.7.

<sup>23</sup> ERG Africa, “Chambishi Metals: A Refinery Producing LME Primary Cobalt Metal and Copper,” Webpage; and Donna Slater, “Jubilee Achieves Export-Grade Cobalt from Sable Refinery,” Mining Weekly, November 22, 2022.

<sup>24</sup> Donna Slater, “Jubilee Achieves Export-Grade Cobalt from Sable Refinery,” Mining Weekly, November 22, 2022.

<sup>25</sup> Reuters, “ERG Suspends Zambia Refinery on Shortage of Cobalt, Copper Concentrates,” January 23, 2020; and Kobaloni Energy, “About,” Webpage.

<sup>26</sup> SAFE findings from expert interviews.

<sup>27</sup> See e.g., Taonga Mitimangi, “First Quantum Starts Output at Africa’s Biggest Nickel Mine,” Bloomberg, July 2023, 2023; and Mining.com, “Operations Resumed at Zambia’s Munali Nickel Mine,” April 17, 2019.

<sup>28</sup> ZCCM-IH, “ZCCM-IH Commences Manganese Mining Operations in Serenje,” Press Release, Mah 5, 2020.

**While much of the focus is on building a regional EV supply chain, Zambia’s main mineral product, copper, is also a vital input for other energy technologies, electronics, and the infrastructure needed to support electric and digital networks.**<sup>29</sup> Copper foils are used in lithium-ion batteries while electric motors can each contain more than a mile of copper wiring.<sup>30</sup> Similar copper wire and sheet products have other applications that should not be overlooked when assessing the opportunities along the copper value chain.

**The Zambian Government has pursued reforms to its mining regulations that incentivize foreign investments in the mining sector.** These policy developments have included the removal of most of the long-term speculative license holders that are currently preventing new exploration and the resolution of the contentious issues surrounding the non-deductibility of mineral royalty payments from corporate income taxes.<sup>31</sup> Overall policy developments have had a positive impact on investment from the private sector. For example, Anglo American made its first investment in Zambia in 20 years by acquiring a majority stake at Arc Minerals, a junior exploration firm with exploration licenses in the copper-rich North-Western Province.<sup>32</sup> KoBold, a U.S. company, invested \$150 million into copper exploration in the Copperbelt, backed by Breakthrough Energy Ventures.<sup>33</sup> First Quantum Minerals announced a further \$1.25 billion investment in its Kansanshi copper-gold mine, the largest copper-producing mine in Africa.<sup>34</sup>

To build on existing efforts, Zambia’s Ministry of Mines and Mineral Development (MMMD) is planning to repeal the Mining Law of 2015 and form a Mining Commission with the intention to increase predictability for the private sector and better ensure land tenure.<sup>35</sup> It will be important to have more transparency moving forward on the specific aspects of the law MMMD is looking to improve.

**Existing Multi-Facility Economic Zones (MFEZs) provide a good analogue for future special economic zones (SEZs) intended to attract investment in downstream supply chain activities and supportive industries for mining and processing because they involve local communities and municipalities.** The Zambian government established the first MFEZs in 2005 to enhance the country’s competitiveness and industrialization.<sup>36</sup> MFEZs and other special economic zones incentivize value addition to the product and the surrounding community before consuming or

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<sup>29</sup> See e.g., Bechtel, “Copper,” Webpage.

<sup>30</sup> Nicholas LePan, “How Much Copper is in an Electric Vehicle?” Visual Capitalist, November 13, 2018.

<sup>31</sup> Joseph Alexander Jalasi, Jr. and Eric Suwilanji Sitwamba, Mining Laws and Regulations Zambia 2023, ICLG.com, September 20, 2022.

<sup>32</sup> Helen Reid, “Anglo American to Return to Zambia with Arc Minerals Copper Deal,” Reuters, May 12, 2022.

<sup>33</sup> Reuters, “Billionaire-Backed KoBold Metals to Invest in Zambia Copper Mine,” December 14, 2022.

<sup>34</sup> Reuters, “First Quantum Minerals Approves \$1.25 Billion Mine Expansion in Zambia,” May 9, 2022; and First Quantum Minerals, “Kansanshi,” Webpage.

<sup>35</sup> SAFE takeaway from the U.S.-Zambia Battery Council Workshop.

<sup>36</sup> Douglas Zhihua Zeng, Multi-Facility Economic Zones in Zambia: Progress, Challenges and Possible Interventions, World Bank, Working Paper, February 2016, at page 2.

exporting the product. They provide benefits to investors by allowing businesses within the MFEZs to keep all profits on the products they export for the first 10 years of operation, by removing duties on imported equipment, and/or expediting construction timelines.<sup>37</sup> MFEZs may also spur local investment. For example, Investreck, a Zambian company that supplies mining equipment and services, plans to build a plant in the Kalumbila MFEZ, where they will manufacture water purification products serving the mines, employ hundreds of people, and build supporting infrastructure.<sup>38</sup>

The success of MFEZs and any other special economic zones, however, will depend on the availability of infrastructure (road, rail, energy, etc.) as well as proper governance. A recent IMF paper argues that there is little evidence to prove any positive economic growth impact of the MFEZs from 2011 to 2021.<sup>39</sup> MFEZs appear to suffer from the same obstacles operations outside the special economic zone would face: a lack of reliable energy supply, limited road access, delays in tax refunds, issues related to land ownership, and barriers to getting certain licenses or permits—all problems that were raised by the private sector during a survey conducted by the Zambia Development Agency and the Ministry of Finance and National Planning.<sup>40</sup> This issue may partially result from taxes being preferentially deferred within SEZs, meaning there is little new revenue available for improving general infrastructure.<sup>41</sup> MFEZs would benefit from a reexamination to identify effective incentive structures beyond tax breaks. Lessons from past failures and successes will come in handy if the country hopes to avoid repeating the same mistakes and address private sector concerns.

**There is strong civil society engagement to promote electric vehicles (EVs).** Zambia is home to organizations like the Zambian Electric Mobility Innovation Alliance (ZEMIA), a nonprofit group looking to drive EV adoption and deployment. ZEMIA has seven working groups to focus on supporting domestic policies and incentives to drive EV adoption, strategies to expand and enhance EV charging network across the country, innovative solutions such as smart charging systems to enhance energy management, and manufacturing and distribution of electric two-wheelers to promote local jobs. ZEMIA works closely with stakeholders along the EV value chain to attract investments to Zambia and supports academic and workforce training programs to advance knowledge and skills in EV technologies.<sup>42</sup>

**Downstream companies, like electric e-bike producers, are exploring options to locate in Zambia.** Demand for electric two- and three-wheelers and mini buses provides the greatest

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<sup>37</sup> Mining for Zambia, “A New Business Hub in North-Western Province,” September 23, 2022.

<sup>38</sup> Ibid.

<sup>39</sup> International Monetary Fund, “[Boosting Sustainable Growth](#),” in *Zambia: Selected Issues*, July 13, 2023, at pages 7 to 10.

<sup>40</sup> Ibid.

<sup>41</sup> Ibid.

<sup>42</sup> ZEMIA, “About,” Webpage; and SAFE takeaways from the U.S.-Zambia Battery Council Workshop.



opportunity for developing local end-to-end battery supply chains in each country. Local demand can lead to vehicle manufacturing and assembly, followed by pack manufacturing. This could lay the foundation for future battery cell production, which requires greater levels of expertise.<sup>43</sup> There are also opportunities to catalyze the development of other industrial sectors adjacent to the EV value chain.<sup>44</sup>

## Challenges

### **Overall economic conditions and the recent debt crisis dampen broader investor interest.**

When the Zambian government defaulted on its sovereign debt in 2020, its economic development program and the inflow of new foreign investment stalled.<sup>45</sup> Although mining investment in Zambia has picked up, the overall investment climate remained sluggish in 2023 due to the protracted resolution of Zambia's debt default.<sup>46</sup> Investment in the country's economy and related infrastructure as a whole—not just in the mining industry—is needed to help Zambia overcome its debt crisis. It remains to be seen how investors will respond now that the government has reached an agreement to restructure its debts.<sup>47</sup>

**Abrupt policy changes have generated uncertainties for investors and undermined the profitability of the mining sector.** Multiple nationalization attempts between the 1970s and 2000s led to the economic decline of the country's Copperbelt. One report estimates that the country lost \$45 billion in potential income due to its resource policies between 1970 and 2010.<sup>48</sup>

Consequently, most of Zambia's copper production today comes from the North-Western Province, not the Copperbelt, which used to be Zambia's vibrant copper hub (note that the Copperbelt continues to be a significant contributor to GDP).<sup>49</sup> Between 2002 and 2018, the Zambian government implemented ten tax regime changes affecting the mining industry.<sup>50</sup> While the policy changes under President Hichilema have been favorable and catalyzed more foreign investment, some investors are still concerned about the level of regulatory stability. Long-term predictability and stability of Zambia's fiscal regime will be critical to attracting diverse sources of foreign investment, especially at a time when the country is grappling with a debt crisis.<sup>51</sup>

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<sup>43</sup> SAFE takeaways from the U.S.-Zambia Battery Council Workshop.

<sup>44</sup> SAFE takeaways from the U.S.-Zambia Battery Council Workshop.

<sup>45</sup> See e.g., Leigh Thomas, Jorgelina Do Rosario, and Chris Mfula, "Zambia Seals \$6.3 Billion Restructure in Breakthrough for Indebted Nations," Reuters, June 23, 2023.

<sup>46</sup> Karin Strohecker, "Zambia Debt Rework Delaying Impede Key Investments, Hitting the 'Most Vulnerable' – FinMin," Reuters, November 24, 2023.

<sup>47</sup> Matthew Hill and Taonga Mitimangi, "Zambia Reaches Deal with Bondholders on Debt Restructuring," Bloomberg, October 26, 2023.

<sup>48</sup> Matthew Hill, "Zambia to Cede ZCCM Control in Nationalization Step Back," Bloomberg, October 8, 2013.

<sup>49</sup> Joseph Cotterill, "Zambia's Plan to Dig Its Way out of Debt With a Copper Revival," Financial Times, August 13, 2023.

<sup>50</sup> See e.g., David Manley, *Ninth Time Lucky: Is Zambia's Mining Tax the Best Approach to an Uncertain Future*, Natural Resource Governance Institute, October 2017.

<sup>51</sup> SAFE takeaways from the U.S.-Zambia Battery Council Workshop.

**Limited geologic knowledge of potential resources is a barrier to further investment, particularly in non-copper mineral resources.** The total mineral resource potential of the country is unknown.<sup>52</sup> Large swathes of Zambia have yet to be geologically mapped, including, perhaps surprisingly, in the Copperbelt region.<sup>53</sup> A collection of core samples collected from previous exploration efforts can serve as a potentially easy and relatively cheap alternative to discovering new deposits, but there has been a historic underinvestment in the country’s core repository at Kalalushi.<sup>54</sup> ZCCM-IH has built a new geologic core repository and plans to begin boxing cores soon.<sup>55</sup> Maintenance of this new facility will be critical to the preservation of core samples.

**A robust minerals ecosystem will also require significant investment to overcome Zambia’s infrastructure deficit, especially energy and connectivity.** Only 25 percent of Zambians have access to electricity, and 96 percent of that electricity comes from hydroelectric dams in need of repair and retrofitting.<sup>56</sup> The Zambezi River Basin provides 94 percent of the country’s power mix, making the energy market extremely vulnerable to climate shocks and power outages due to drought conditions.<sup>57</sup> Multiple countries and multilateral organizations have provided aid or investment for projects to upgrade hydroelectric dams and install solar throughout Zambia.

These projects included the development of the Renewable Energy Feed-in Tariff (REFit) Strategy funded by USAID via Power Africa and its Southern Africa Energy Program, and the implementation of REFit through GET FIT Zambia, funded by the German Development Bank, the development of the Bangweulu solar PV project funded by USAID/Power Africa and the International Finance Corporation, the UK-Zambia Green Growth Compact, and the rehabilitation of the Kariba Dam with funding from the African Development Bank, the European Union, the Government of Sweden, and the World Bank.<sup>58</sup>

Connectivity between the mines, ports, and destination markets also makes growing the mining and processing sectors challenging. As it stands, it can take more than a month for trucks transporting copper from mines in Zambia and the DRC to reach ports in Namibia, Mozambique, and South Africa due to bottlenecks and traffic jams.<sup>59</sup> The development of the Lobito Corridor,

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<sup>52</sup> Evaristo Kasumba and Chanza Chifwepa, “The Potential of Mineral Exploration in Zambia,” Geological Survey Department, Ministry of Miners & Mineral Development, September 2016.

<sup>53</sup> SAFE findings from the U.S.-Zambia Battery Council Workshop.

<sup>54</sup> Ibid.

<sup>55</sup> Ibid.

<sup>56</sup> Energy Regulation Board, “Electricity Regulation,” Webpage; and World Bank, “Electricity Production from Hydroelectric Sources (% of Total) – Zambia,” Dataset.

<sup>57</sup> Alex Donaldson, “UK and Zambia Announce Renewables and Mining Investments,” Mining Technology, August 3, 2023.

<sup>58</sup> Harriet Zulu, “Energy Statistics in Zambia,” Department of Energy, Presentation, n.d.; Chando Mapoma, “Zambia Energized by United States and Power Africa Initiative,” USAID, Archived Webpage, March 11, 2019; World Bank, “The Kariba Dam Rehabilitation Project: Fact Sheet,” February 24, 2015; and Reuters, “Britain Agrees Deals on Clean Energy, Critical Minerals with Zambia,” August 2, 2023.

<sup>59</sup> Matthew Hill, “The Metals for Your EV are Stuck in a 30-Mile Traffic Jam,” Bloomberg, November 3, 2022.

which will connect Zambia and the DRC to Angola and the rest of the world through a railway is a promising step as it will cut copper shipping distances across Africa in half for some projects.<sup>60</sup> Additional brownfield and greenfield projects, however, will be needed to connect mineral-producing mines, refineries, and other industrial facilities to the Lobito Corridor.

**Environmental contamination and labor rights are points of contention between local communities and the government.** The Zambian government must contend with these issues if it wants to see significant foreign investment in the minerals sector. In the Copperbelt Province, townships adjacent to copper mines are severely polluted due to poor governance and inadequate government funding. One of the biggest issues facing communities in Zambia is polluted soil, mainly with lead, impacting the agriculture industry.<sup>61</sup> There are also reports of labor concerns in Chinese-owned mines.<sup>62</sup> Improving environmental and labor conditions will be critical to enhance the competitiveness of responsible players in the country, reduce the risk of future operational disruptions, and attract investment along the minerals value chain. President Hichilema is taking steps in this direction. He pledged to make environmental regulatory changes.<sup>63</sup> An important first step in the meantime will be effectively monitoring and enforcing existing laws and regulations.

## Opportunities and Challenges in Democratic Republic of the Congo

It is very difficult to separate artisanal and industrial cobalt extraction because they are often mined in the same geographic context and mixed at trade and buying houses.<sup>64</sup> Larger operations have the heavy equipment necessary to dig into the underlying bedrock and produce large tailings piles. These mines and tailings become points of interest for artisanal miners and local communities who lack sophisticated equipment.<sup>65</sup>

Artisanal mining is legally permissible for those who obtain land use and exploitation permits, referred to as Artisanal Mining Exploitation Zones or Zone d'Exploitation Artisanale (ZEAs). A 2021 report by the German Federal Institute for Geosciences and Natural Resources (BGR) identified 67 registered cobalt and copper-producing artisanal mines.<sup>66</sup> If artisanal miners discover

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<sup>60</sup> See e.g., Ivanhoe Mines, "Ivanhoe Mines' Exports Commence from Kamo-a-Kakula Copper Complex Along Lobito Atlantic Rail Corridor," January 2, 2024.

<sup>61</sup> Chipasha Mulenga, "Soil Governance and the Control of Mining Pollution in Zambia," *Soil Security*, Volume 6, March 2022.

<sup>62</sup> Jacqueline Muna Musiitwa, "Chinese Mining Companies and their Social License to Operate in Zambia," *China, Law, and Development*, April 29, 2021.

<sup>63</sup> Juliane Kippenberg and Namu Chuma, "Zambia's 'Green Kabwe' Plan Should Prioritize Mine Cleanup," *Human Rights Watch*, April 3, 2023.

<sup>64</sup> Dorathee Baumnan-Pauly and Serra Cremer Iyi, "As Cobalt Demand Booms, Companies Must Do More to Protect Congolese Miners," *The Conversation*, November 25, 2020.

<sup>65</sup> See e.g., Raphael Deberdt, *Baseline Study of Artisanal and Small-Scale Cobalt Mining in the Democratic Republic of the Congo*, University of British Columbia, July 2021, at page 11.

<sup>66</sup> Aimery de Schoutheete, et al, "The Mining Law Review: Democratic Republic of the Congo," *The Law Reviews*, October 11, 2021.

commercially viable deposits, the Minister of Mines has the legal authority to close the site within 60 days and turn it into an industrial zone. Once a large-scale operation is developed, it cannot be reverted to artisanal purposes.<sup>67</sup> As a result, most of the cobalt artisanal mining occurs on private concessions with active industrial operations.<sup>68</sup>

Artisanal miners construct dangerous tunnels that can reach up to 100 meters in depth, more than three times the legal limit, on unstable slopes. Lack of adequate safety measures causes major incidents and leads to great bodily harm and death. Children as young as six years old are used to reach tight spaces and crawl into the small cracks and tunnels that adults cannot reach. Of an estimated 255,000 Congolese involved in ASM cobalt, an estimated 40,000 are children.<sup>69</sup>

Cobalt beneficiation varies from industrial and artisanal sites, highlighting the technological divide between these two different mining operations. From the industrial side, nearby crude refiners convert cobalt ore into cobalt hydroxide to export for further refining. As of 2020, five refineries were noted: Gécamines, Lubumbashi, Luilu, Mutanda, and Usoke.<sup>70</sup> On the ASM side, communities are left with rudimentary and manual methods to separate ore. Material is then often sold to local traders or even local industrial sites where it is processed further before heading to overseas markets.

Artisanal miners rarely receive the fair value of the mineral they mine. Trading houses that buy cobalt from artisanal miners are mostly run by Chinese players and are notorious for deflating the price of cobalt and undercutting artisanal miners who already have a limited number of buyers they can sell to due to their precarious legal standing. Cooperative owners, on the other hand, commonly demand unofficial membership payments from their miners, which can amount to 20 percent of their production.<sup>71</sup> Additionally, elites often own large plots of land and offer artisanal miners who have been expelled from illegal ASM sites to mine on their property for a share of their profits.<sup>72</sup>

Entreprise Générale du Cobalt (EGC) was established by the Congolese government in 2019 to serve as the sole entity in charge of purchasing and selling artisanal cobalt but failed to take control over the trading of ASM cobalt.<sup>73</sup> A complex set of factors contributed to its problems,

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<sup>67</sup> Ibid.

<sup>68</sup> Delve, “Democratic Republic of Congo Artisanal and Small-Scale Mining Sector,” 2020, at page 14.

<sup>69</sup> Michel Michele Gabiola Lawson, “The DRC Mining Industry: Child Labor and Formalization of Small-Scale Mining,” The Wilson Center, September 1, 2021.

<sup>70</sup> Siyamend Barazi, et al., “Cobalt from The DR Congo – Potential, Risks and Significance for The Global Cobalt Market,” German Federal Institute for Geosciences and Natural Resources, May 1, 2017.

<sup>71</sup> Ibid, at pages 6-7.

<sup>72</sup> Interview 22, Academic, 23 March 2022.

<sup>73</sup> Entreprise Générale Du Cobalt, “Official Launch of Entreprise Générale du Cobalt in the Democratic Republic of the Congo,” March 31, 2021.

including Chinese interests in upholding existing cooperative and trading networks.<sup>74</sup> Critics point to ASM formalization as a solution. To date, governments, nonprofits, and industry actors have launched three cobalt formalization projects in the DRC with varying degrees of success. Some efforts have come to a halt due to a decline in cobalt prices and uncertainties around reserve potentials.<sup>75</sup>

The DRC will continue to be the largest producer of cobalt for the foreseeable future, however recent developments in the cobalt markets show just how little control the country has over the price of cobalt.<sup>76</sup> The influx of cobalt produced as a byproduct of nickel production in Indonesia, for example, brought down market prices from \$40 per pound to \$15 per pound.<sup>77</sup> The DRC is looking to move down the EV battery value chain and ramp up domestic production of other critical minerals to reduce its exposure to the volatility of the cobalt market. More exploration, however, is needed to help identify new reserves.

### *Opportunities*

**The DRC’s potential for economically viable mineral deposits is very high.** While the Congolese mining sector has predominantly focused on copper and cobalt, the country could become a producer of other critical minerals including nickel, lithium, manganese, and by-product minerals with important digital and defense applications.<sup>78</sup> Its resources, however, need further exploration.

**The DRC government is engaged in capacity building and transparency initiatives with international partners, the U.S., and other countries, including its continued voluntary participation in EITI, the USAID Sustainable Mine Site Validation project, and the Global Trace Protocol Project.** DRC EITI advanced disclosures on resource-backed infrastructure agreements and the activities of state-owned enterprises and their financial relationship to the state, informing public debate on politically sensitive topics that had been previously considered off limits.<sup>79</sup> USAID Sustainable Mine Site Validation (SMSV) Project focused on conflict minerals and provided training for DRC mining inspectors, controllers, and multi-stakeholder committees, with spillover benefits in the copper and cobalt sectors.<sup>80</sup> Finally, the Department of Labor’s (DOL) Global Trade Protocol

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<sup>74</sup> Harry Dempsey, “Artisanal Mining: the Struggle to Clean Up a Murky Industry,” *Financial Times*, July 6, 2023.

<sup>75</sup> See e.g., World Economic Forum, *Making Mining Safe and Fair: Artisanal Cobalt Extraction in the Democratic Republic of the Congo*, September 2020; Sara Johansson de Silva et al., “The Mutoshi Pilot Project,” *Delve*, April 10, 2020; and Pact, “Mutoshi ASM Pilot,” Webpage.

<sup>76</sup> Karl Decena, “Indonesia Emerging as Major Cobalt Supplier Amid Lingering ESG Concerns,” *S&P Global*, July 31, 2023.

<sup>77</sup> Edward Burrier and Thomas Sheehy, “Challenging China’s Grip on Critical Minerals Can Be a Boon for Africa’s Future,” *United States Institute of Peace*, June 7, 2023.

<sup>78</sup> SAFE findings from expert interviews.

<sup>79</sup> EITI International Secretariat, *Validation of the Democratic Republic of the Congo Final Assessment of progress in implementing the EITI Standard*, July 18, 2022, at page 4.

<sup>80</sup> U.S. Embassy in the Democratic Republic of the Congo, “USAID Awards a New Artisanal Mine Site Validation Project,” *Press Release*, July 18, 2019.

Project aims to test supply chain tracing solutions for minerals produced by child or forced labor and share learnings to better support their adoption by producers across various sectors.<sup>81</sup>

**Several pilot projects to combat child labor in the ASM cobalt sector have been launched in the last couple of years.** However, successful pilot projects to combat child labor remain difficult to scale up in a self-sustaining manner. While groups like PABEA-COBALT exist, there are still major discrepancies between Congolese, U.S., and civil society estimates of child labor in the Congolese supply chain.<sup>82</sup> To address these issues, the U.S. government in collaboration with the Congolese government recently launched the Child Labor Monitoring and Remediation System.<sup>83</sup> Additionally, greater transparency throughout the system, supply chain due diligence, and eventual traceability of minerals will allow companies to monitor production attributes and movements of minerals, adding value to mining companies. Broader engagement under the tripartite MOU when tied to commercial opportunities could provide incentives to enhance efforts in combatting child labor.

**The ASM sector is not under a binding contract with Chinese buyers and, with the right transparency and traceability safeguards in place to prevent child labor, the sector can serve as a readily available source of cobalt for refineries in the DRC and the United States.** Ignoring the problems in the DRC’s ASM sector and completely banning ASM products is also not an option that will lead to positive change. Mega-mines do very little for the average person in the DRC. ASM remains an important source of income for many Congolese communities.<sup>84</sup> Current wisdom is that without ASM professionalization, there will not be enough ways to absorb the excess labor pool, so ASM must be a part of the solution.<sup>85</sup>

Stakeholders also point to other strategic considerations. ASM cobalt from the DRC accounts for anywhere from 10 to 20 percent of annual global production—an amount not locked in contracts with Chinese entities.<sup>86</sup> While Chinese traders have significant influence, bringing in alternative buyers can easily weaken their power and, when paired with efforts to formalize the ASM sector, improve transparency, and combat child labor, such a strategy could help move toward meaningful progress in the professionalization of the ASM sector.<sup>87</sup> A public and political paradigm shift, however, is needed for Western companies, consumers, decision-makers, and other stakeholders to accept responsible artisanal production.

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<sup>81</sup> U.S. Department of Labor, “Global Trace Project,” Bureau of International Labor Affairs, Webpage.

<sup>82</sup> SAFE takeaways from the U.S.-DRC Battery Council Workshop.

<sup>83</sup> Ibid.

<sup>84</sup> Lucia Mancini et al, “Assessing Impacts of Responsible Sourcing Initiatives for Cobalt: Insights from a Case Study, Resources Policy, Volume 71, June 2021, at page 3.

<sup>85</sup> SAFE takeaway from expert interviews and the U.S.-DRC Battery Council Workshop.

<sup>86</sup> SAFE analysis based on data from the U.S. Geological Survey and U.S. Department of Labor.

<sup>87</sup> SAFE takeaway from the U.S.-DRC Battery Council Workshop.

**Serious in its plans to move down the battery value chain and build African expertise in battery making, the DRC with support from the United Nations Economic Commission for Africa, established the Center of Excellence for Advanced Batteries (CEAB).** The goal of CEAB is to form academic and industrial partnerships and create a seven-semester curriculum spanning the entire EV battery supply chain.<sup>88</sup> The Center will train students to operate facilities at each part of the EV supply chain—from pilot to commercial scale—in the DRC.<sup>89</sup> The Center also proposes developing a hydrometallurgical laboratory to train students in nickel refining and sulfate, precursor, and cathode active material production.<sup>90</sup>

### *Challenges*

**The majority of cobalt produced in the DRC today is locked in contracts to be shipped to China. There are limited options to provide the necessary feedstock for future processing facilities in the region.**<sup>91</sup> New mines can be built in the country; however, they will require investments in exploration as the best-known copper-cobalt deposits are already licensed, mostly to Chinese companies.<sup>92</sup> The processing facilities may need to wait until this new supply from industrial mines is brought online or alternative feedstocks are secured.

**Less than 50 percent of the DRC has been geologically mapped at high resolution.**<sup>93</sup> The DRC needs to increase its capacity for geologic mapping.

**While the reputational risks associated with the ASM sector, specifically child labor, continue to leave companies wary to commit to the region, more structural issues are also at play, including poor governance and lack of access to adequate infrastructure.** Only four of the DRC's 25 provincial capitals can be accessed by reliable roads from Kinshasa.<sup>94</sup> Additionally, although the DRC has an extensive rail network, the railway system is not functioning due to broken infrastructure, poor management, and high operational costs.<sup>95</sup> As such, the development of a reliable transport network is a critical component to stimulating broad-based economic growth. Furthermore, doing business is hard in the DRC. Business licenses and permits are difficult to obtain and asset transfers are mired in corruption.<sup>96</sup>

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<sup>88</sup> SAFE takeaway from the U.S.-DRC Battery Council Workshop.

<sup>89</sup> Ibid.

<sup>90</sup> Ibid.

<sup>91</sup> SAFE analysis based on findings from expert interviews.

<sup>92</sup> SAFE takeaway from the U.S.-DRC Battery Council Workshop.

<sup>93</sup> Ibid.

<sup>94</sup> World Bank. "International Development Association Project Appraisal Document on a Proposed Credit in the Amount of US \$427.98 Million and a Proposed Grant in the Amount of SDR 53.6 Million to the Democratic Republic of Congo for a Transport and Connectivity Support Project." May 26, 2022, at pages 9 to 12.

<sup>95</sup> Ibid.

<sup>96</sup> David Manley, Patrick Heller, and William Davis, No Times to Waste: Governing Cobalt Amid the Energy Transition, Natural Resource Governance Institute, March 2022, at page 21.

**Licensing is also challenging in the ASM sector. Obtaining the proper licenses and identification requires government approval and it is not an efficient process for citizens.** This can delay a project from having ZEAs and forming cooperatives.<sup>97</sup> Having provincial and federal government support is important, but there needs to be an established baseline of transparency and accountability in the licensing process.

**Even if all governance structures are put in place, the cost to adhere to international standards is a high barrier to entry for most small- and mid-capital mines, trading houses, and refiners in Africa.** The cost of an external audit ranges from \$500,000 to \$1 million and most standards require routine audits. The cost of blockchain deployment ranges between \$100,00–\$200,000, with an additional \$25,000–\$50,000 for integration and customization.<sup>98</sup>

### Key Takeaways for the U.S. Government

With more countries turning to Africa for its resource potential, the continent is becoming a competitive landscape for foreign governments, particularly a battle zone for the geopolitical competition between the United States and China. Echoing the Non-Alignment Movement of the Cold War, African nations do not wish to choose sides between two different countries coming to the continent to exploit their resources. Instead, their priorities are focused on building a robust ecosystem around critical minerals, which includes industries beyond mining and processing, such as associated equipment manufacturing, downstream assembly, and other supportive sectors.

The race to build diverse supply chains and secure critical mineral supplies is not a zero-sum game. The U.S. government should promote long-term, win-win partnerships that deliver benefits to local populations in Africa while building supply streams that can integrate with the U.S. market and diversify the sources of critical minerals and mineral-intensive products. Collaboration with the United States can help bring new, additional capital to Africa and allow countries on the continent to diversify sources of foreign direct investment.

It is important to note that investments in Africa are not intended to replace investments in the United States or other partner countries. But given the sheer volume of materials needed to support our growing energy needs, these investments would bolster America’s overall efforts to build more diverse, secure, and sustainable critical mineral and battery supply chains.

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<sup>97</sup> See e.g., Emmanuel Umpula and Eric Bisil, “Formalizing Artisanal Cobalt Mining in the DRC: Much Work Remains,” International Institute for Environment and Development, July 25, 2023.

<sup>98</sup> Kwasi Ampofo and Sophie Lu, “Solving the ‘Blood Cobalt’ Challenge for EVs,” Bloomberg NEF, November 4, 2019.



Below are the Minerals Center’s key takeaways from the workshops and recommendations for the U.S. government. They have been updated to reflect recent and relevant U.S. and allied policy developments since the convening took place.

### *There is an Urgency to Deliver on Projects*

Weary of foreign countries courting them just to exploit their resources, African countries are trying to identify deals and partnerships that can achieve inclusive growth—and deliver visible, impactful projects in a relatively quick timeframe. While the U.S. government has traditionally supported institutional capacity-building efforts to bolster good governance in the region, it needs to recalibrate its engagement.<sup>99</sup> Such recalibration should not replace existing programs and instead enable new avenues for engagement on industrial projects. Tangible commercial-scale investments can be utilized to negotiate advancements in other diplomatic and programmatic efforts to promote responsible mining, combat child labor, improve resource governance, and enhance transparency along the minerals value chain.

Depending on the size of the project, investments for a single facility, especially a mine or refinery, can require hundreds of millions of dollars. The average investment in the 23 cobalt-producing mines the Minerals Center is tracking in the DRC, for example, was \$880 million.<sup>100</sup> The United States does not have state-owned companies to invest in mining, processing, or manufacturing in Africa, so will largely rely on the private sector to bring projects to life. Financial incentives from the U.S. government can improve project cost structures and draw in the much-needed private capital. Funding from the U.S. government can also be used to conduct feasibility and pre-feasibility studies to assure investors of the economic viability of the project.

DFC, for example, provided a \$150 million loan to Twigg Exploration and Mining Limitada to support their graphite mining and processing operations in Mozambique.<sup>101</sup> The U.S. Embassy in Botswana, on the other hand, hosted a Direct Line event on critical minerals, highlighting opportunities in the country’s largest critical mineral deposits.<sup>102</sup>

- ***The DFC, and its international counterparts in allied countries and on the African continent, can be mobilized to finance economically viable projects that support the implementation of the tripartite MOU.***

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<sup>99</sup> See e.g., USAID, “Democratic Republic of the Congo: Our Work,” Webpage; and USAID, “Zambia: Our Work,” Webpage.

<sup>100</sup> Darton Commodities, “Cobalt Market Review 2022,” *Darton Commodities Limited*, 2022

<sup>101</sup> U.S. International Development Finance Corporation, “DFC Makes More than \$9.1 Billion in Financial Commitments for Fiscal Year 2023,” Press release, October 5, 2023.

<sup>102</sup> U.S. Department of State, “Critical Minerals in Botswana,” Bureau of Economic and Business Affairs, October 17, 2023.

- ***The State Department, through the Direct Line program, or other mechanisms can promote existing projects and improve their visibility to financiers and mineral off-takers. These can be amplified via the Minerals Security Partnership (MSP) network.***
- ***Identifying and activating pools of capital, via Prosper Africa for example, should be done simultaneously with diplomatic and government financing efforts. This line of thinking has informed the development of the Minerals Investment Network for Vital Energy Security (MINVEST), a public-private partnership between SAFE and the State Department.***

The U.S. government cannot solely rely on the DFC to deliver billion dollar projects. There may be opportunities to bring in international partners and MSP members from the European Union, United Kingdom, Japan, or other interested countries to bridge financing gaps, especially if those countries have similar compacts with Zambia and the DRC or if companies from those jurisdictions are exploring investment opportunities in the region. The European Union, for example, has a partnership through its Global Gateway Forum to invest in critical raw material value chains in Zambia and the DRC.<sup>103</sup> Another example is the UK-Zambia Green Growth Compact, which has an investment angle.<sup>104</sup> India, an MSP member country, can be another key partner given the number of Indian companies already operating in the region. Finally, DFC efforts can be complemented by host countries and African development finance institutions, like the Africa Finance Corporation and the African Development Bank.

- ***The State Department should collaborate with like-minded countries interested in the region’s investment opportunities via the MSP and PGI. Particular attention should be given to identifying opportunities for further collaboration between partners already engaged in the region, such as the United States, the European Union, and the United Kingdom, their respective export credit agencies (if applicable), and development finance institutions.***

Government support in the form of facilitation, door-opening, or de-risking for commercial-scale projects, especially for investments that will require hundreds of millions of dollars, will be necessary to enable the private sector to enter Zambia and the DRC with more confidence. Private sector companies face a competitive disadvantage compared to their state-backed Chinese counterparts, who benefit from government-to-government engagement on issues like licensing and contract negotiations. Robust commercial diplomacy can support the private sector in navigating complex licensing and permitting processes, address existing and future barriers to trade and investment, and promote the smooth functioning of business. Successful examples from

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<sup>103</sup> European Commission, “Global Gateway: EU Signs Strategic Partnerships on Critical Raw Materials Value Chains with DRC and Zambia and Advanced Cooperation with US and Other Key Partners to Develop the ‘Lobito Corridor,’” Press Release, October 26, 2023.

<sup>104</sup> UK Government, “UK Supports Green Growth in Zambia,” Press Release, August 3, 2023.

the past include U.S. government support to help MMMD review mining legislation and improve understanding of the current legal landscape.<sup>105</sup>

- ***The State Department and U.S. embassies in Zambia and the DRC will continue to play a critical role in providing commercial diplomacy support to companies to improve the ease of doing business in the region.***
- ***Additionally, more U.S. government coordination will be needed between its embassies on the ground and agencies with available funding and subject matter expertise to ensure priority projects in the region are considered and moved forward.***

### *While the Private Sector Will Drive Investment in Commercial Projects, Government Support is Needed to Reduce Infrastructure Deficits*

Mining, processing, and manufacturing are energy-intensive activities. Access to cheap, reliable, and clean energy will be critical. To improve both countries' access to global markets, Zambia and the DRC will also require investments in infrastructure projects, such as road and rail, that they alone cannot deliver.

While driven by commercial considerations, infrastructure investments can also benefit local populations depending on the size and access restrictions of the project. Power infrastructure built for commercial use, for example, can also provide electricity to local communities. The PGI will play a key role in connecting the two countries to the Lobito port in Angola, which will provide the countries with a direct link to Western markets. The project is backed by the United States, the European Union, and the Africa Development Bank, who are looking to raise a total of \$1.6 billion in public and private sector financing.<sup>106</sup> The broader vision is to eventually build an open-access rail network connecting the Atlantic Ocean to the Indian Ocean.<sup>107</sup> This expansion would create new links to markets in the Indo-Pacific.

Additional infrastructure investment will be needed to bridge the power deficit and develop local transportation infrastructure that connects mines, refineries, manufacturing facilities, and special economic zones to the Lobito Corridor.

- ***The U.S. government should leverage Power Africa to build affordable, reliable, and clean power generation capacity in Zambia. Funding and technical assistance should also be provided to rehabilitate existing power infrastructure projects, successfully integrate clean energy projects into the grid, and speed up licensing processes for independent power producers. Power Africa should consider prioritizing energy projects that provide electricity to special economic zones, mines, refineries, and manufacturing facilities with U.S. government backing.***

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<sup>105</sup> SAFE takeaways from the U.S.-Zambia Battery Council Workshop.

<sup>106</sup> African Development Bank, "African Development Bank Joins Global Partners to Raise Financing for \$1.6 Bn Multinational Lobito Transportation Corridor Programme," Press Release, October 27, 2023.

<sup>107</sup> Ibid.

- ***The U.S. government should catalyze investment from existing government agencies. Programs including the DFC, the U.S. Trade and Development Agency (USTDA), and Prosper Africa should provide funding to support the building of local transportation infrastructure, as well as technical assistance to support the DRC's and Zambia's infrastructure development goals.***

### *The Need for Increased Technical Programming*

U.S. programmatic engagement in Africa has historically focused on international development and combatting child labor in the case of the DRC. While such engagement is important and is needed for many reasons, including to support the broader investment and business climates within Zambia and the DRC, more technical and at times commercially geared programming will be needed to build capacity in areas like quality geologic mapping, resource governance, and refining to enable skills development.

A special focus should be given to geologic mapping within Zambia and the DRC to help the Zambian and Congolese Geological Surveys develop resource assessments that can then attract exploration and mining companies to invest in the production of copper, cobalt, lithium, nickel, manganese, and by-product minerals with important digital and defense applications from both new deposits and tailings piles of abandoned mines.

- ***The U.S. Geological Survey (USGS) should partner with the Congolese Ministry of Mines and the Zambian Ministry of Mines and Mineral Development to aid in designing resource assessments and in knowledge and technology transfer. USGS can host training programs about proper data-gathering techniques for geophysical and geomagnetic surveys. It can also assist Zambia and the DRC in the development of a master geodatabase of updated geologic mapping. Further diplomatic and programmatic engagement may also be necessary to ensure that available information on resources is disseminated fairly.***
- ***Explore other opportunities for collaboration between the National Labs, U.S. government agencies, their Zambian and Congolese counterparts, and the Battery Councils to enable capacity building and knowledge transfers.***

Technical experts in U.S. government agencies can be particularly helpful in developing a carefully planned, step-by-step roadmap outlining a graduated process down the battery value chain based on the unique energy, infrastructure, workforce, and regulatory challenges and opportunities in each country.

Along the battery value chain, this would mean building capacity for different refining steps upstream through a graduated process, starting with beneficiation and moving toward more complex refining steps to produce battery spec materials. With a feedstock of battery spec material, countries can then develop the capacity to convert these materials into precursors for cathodes, and eventually cathode active material and battery cell manufacturing. Bolstering demand for electric 2- and 3-wheelers and minibuses provides the greatest opportunity for

engagement downstream. A proof concept that shows the demand for these vehicles can attract local vehicle assembly and manufacturing and even less complex battery pack manufacturing facilities—all activities that will lay the foundations for developing skills for more advanced manufacturing industries like battery cell production.

- ***National Labs, the Department of Energy (DOE), and the Department of Commerce should support their Zambian and Congolese counterparts and Battery Councils in their planning of a graduated process to help countries move downstream. The Li-Bridge alliance, a public-private partnership led by Argonne National Labs to develop a domestic supply chain for lithium-ion batteries, can serve as a potential model.***
- ***USTDA can provide funding for early-stage project preparation activities, such as pre-feasibility and feasibility studies, for longer-term strategic projects that require more capacity building.***

## **Other Country-Specific Areas of Collaboration**

### *Zambia*

Zambia has already begun to make progress toward creating a more attractive investment environment for critical minerals and EV battery production. In addition to government efforts, there are also strong civil society and government training groups helping to lay the groundwork for a robust battery ecosystem. Workshop participants proposed the following next steps to continue collaboration on the tripartite MOU:

- The Technical Committee that was formed to support the Zambian Battery Council efforts would benefit from a specific direction and sense of urgency. The establishment of an advisory board and charter to guide the Technical Committee could be appropriate to help the former achieve its goals. The advisory board could be comprised of members of the private sector, civil society, and government representatives from Zambia, the United States, and other allied stakeholders to advise the Technical Committee on the next steps and associated deliverables. In addition to a platform for engaging with subject matter experts to identify key areas of action, the Technical Committee would also benefit from a mechanism to provide accountability and transparency.
- The U.S. government and academic sectors could provide technical aid and knowledge to help Zambia increase transparency and discourage corruption by fully digitizing Zambia's Mining Cadastre. This would build on the progress achieved by ZCCM-IH and private sector companies.
- MMD could engage more with private sector companies to integrate feedback, increase buy-in, build trust, and make the information housed within the Cadastre more useful for all stakeholders.

- MMMD and ZCCM-IH could develop more efficient ways to collect cores from around Zambia and incentivize mining companies to turn over used cores to ensure a more complete library. Available data should be made publicly available.
- The United States could consider expanding the U.S.-Australian-Canadian Critical Minerals Mapping Initiative to include Zambia.
- Workshop participants could connect representatives from the Zambian Ministry of Technology and Science as well as the Ministry of Mines and Mineral Development with the Society of Economic Geology's Zambia Chapter and help establish a Zambia chapter of the Society for Mining, Metallurgy, and Exploration (SME).
- Zambia should leverage its copper wealth and operating mines to not only produce copper foils for EV batteries but also copper cables, wires, motors, and other copper components used in renewable energy technologies, and beyond.
- The Technical Committee could review analyses of existing MFEZs and feedback from industry to provide recommendations to improve MFEZs, specifically those supporting mining, processing, and manufacturing activities along the EV battery value chain. Recommendations could include the specific actions listed above. The advisory board could support the Technical Committee in its efforts. Potential solutions that came up during the discussions include:
  - *Promise efficient government action with the taxes that are collected.* This could include an interactive way to engage with the private companies located in the SEZs to identify the most pressing infrastructure needs and co-fund the projects. Projects could go through a fast-track process with less paperwork.
  - *Extend SEZs along Special Economic Corridors, which could include a holistic mapping of transportation and infrastructure needs to optimize travel and commutes.* Walvis Bay or the Lobito Corridor could be good pilot corridor options.
  - *Pilot processes for more efficient paperwork streams within SEZs.* For example, the Ministry of Mines could experiment with bringing in other ministries for special reviews of projects that have more to do with land justice and green economy to speed up the application process.
  - *Establish monitoring and assurance systems to confirm that companies that invest in SEZs follow through with their promises.* There have been reports of companies collecting incentives without actual development on the land.
- The Technical Committee can help ZEMIA push for policy goals, including EV procurement policies for the Zambian government, and changing tax schemes around both EVs and gasoline cars to create stronger incentives for the former.

- The Technical Committee should consider creating a dialogue with civil society on how to design EVs and EV infrastructure for the unique social ecosystem of Zambia that could identify specific market niches that will aid Zambia’s move toward the goals of the Battery Councils.
- Interested companies with operational facilities across Africa or other parts of the world could begin training a future Zambian workforce through exchange programs. Such programs could be supported and incentivized by the Zambian Battery Council.
- Regional differences lead to region-specific customization opportunities. The Zambian Battery Council in partnership with universities, centers of excellence, or other research institutions should explore and map the whole architecture of industries that can develop around electric vehicles. Examples include adapters that would allow electric vehicles to charge phones, power lights, etc.

### *The Democratic Republic of Congo*

The Congolese Battery Council, or Conseil Congolais de la Batterie (CCB), has created a comprehensive vision to propel the country into the next stages of mineral development and EV battery production. In addition to creating a long-term strategy, the Council established a Center of Excellence for research and development. Workshop participants proposed the following next steps to continue collaboration on the tripartite MOU:

- The CCB has a clear vision and momentum to start the implementation of its plan. It could expand its advisory board to engage with different stakeholders including private sector, civil society, academia, and other subject matter experts who can advise the CCB on key areas of action and associated deliverables. Such a body can also serve as a mechanism to ensure accountability, transparency, and a structure.
- The CCB and CEAB could explore synergies and collaboration opportunities with other international and regional research institutions, including the Pan-African Decarbonization Institute (P-ADI) and the top mining engineering programs around the United States, to prevent unnecessary duplication of metallurgical research.
- As the DRC moves down the EV value chain from extraction to producing refined products, an accredited laboratory or center of excellence will be required to verify the quality of products. CEAB could be leveraged as an accredited metallurgical center to validate upstream and midstream products for battery “specing.” The CEAB could begin this process by collaborating with U.S. National Laboratories and experts.
- CEAB could create an interdisciplinary, pan-African design project that brings together Congolese students across mechanical and electrical engineering, business/economics, and other relevant subjects to design and build battery packs and end-use products that meet local needs. The project can help with training and leverage local entrepreneurship to lay the groundwork for the capacity to build more complex battery packs (e.g. packs with

cooling systems) and eventually battery cells. The U.S. government, through the Department of Energy, could facilitate partnerships with leading U.S. academic institutions.

- The Congolese government should be encouraged to work closely with the DOL to continue research on child and forced labor in copper and cobalt supply chains, improve government capacity in identifying and remediating cases of child labor beyond pilot sites, and enhance industry-wide labor standards. The two governments should leverage the Global Trace Protocol Project to identify and address barriers to supply chain traceability and transparency to show U.S. stakeholders that cobalt from the DRC can be sourced responsibly.
- Continued collaboration between the Congolese government, DOL, and civil society will also be important for continued efforts to professionalize the country's ASM sector.
- A child labor prevalence survey that is representative of the whole cobalt sector can address the knowledge gap about ASM operations in the DRC. The Ministry of Labor should consider providing periodically updated data from the ASM operations (including the number of known child labor violations and remediations) to close the information gap in the ASM sector, better analyze developments in monitoring and remediating child labor, and show successes in the improvement of labor standards. DOL and the International Labor Organization can consider supporting the Ministry of Labor in its efforts.